

Environmental spy



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SCIENTIFIC NEWS.

Mechanics' and Inventors' Journal,

*Devoted to Science, The Arts, Engineering, Mechanics, Patents, Inventions, Shop
and Household Economy.*

➤❖ VOLUME II. ❖➤

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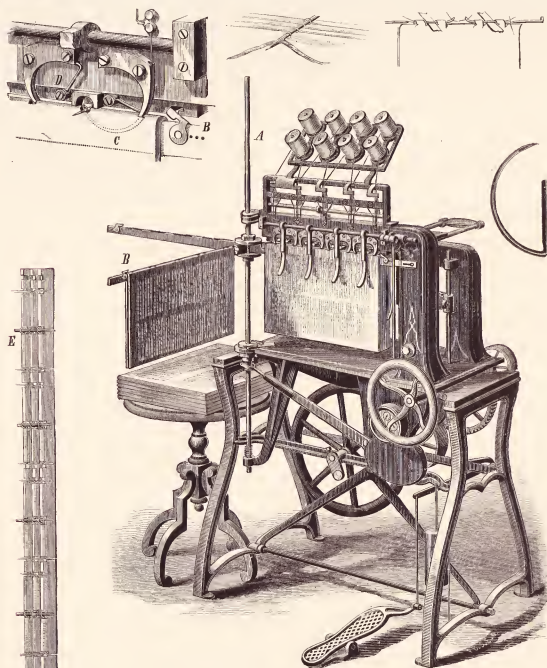
Smyth's New Book-Sewing Machine.

This machine is an entirely new apparatus for sewing together the sheets or signatures of a book. In hand-sewing the thread is passed continuously around strong twines which enter cuts in the back of the volume. An expert sewer can sew about

the point carrying the thread comes up through the fold. Horizontal needles, E, moving from the rear then enter the loops carried by the curved needles, and the latter are retracted; another signature is then brought into place, and the opposite curved needles, D, of the four pairs make the stitch, as already described. In this way the two needles of

The detailed sketches given herewith represent a needle, the mechanism of a pair of needles, a horizontal needle carrying cord through the loops, the back of a book showing the position of the stitches, and a method of sewing in rawhide strengthening-strips using horizontal needles.

The advantages secured by this machine are nu-



SMYTH'S NEW BOOK-SEWING MACHINE.

2,000 signatures per day. With this machine it is asserted a child can sew 60 signatures a minute.

The sheets are placed one at a time on radial bars which project from a vertical rod A. This rod rises and then rises so as to bring the signature under four pairs of curved needles. One needle, C, of each pair enters down at the back of the sheet, and

a pair operate on alternate signatures, the object of the alternating stitches being to make the book of even thickness. After a sufficient number of signatures have been sewed, cords are passed through the eyes of the horizontal needles, and the latter, moving backward, draw the cord through the loops of the stitches, thus locking the same.

merous. It is capable of doing four times more work in a given time than the most expert hand-sewer can perform. It sews with eight threads, each entirely independent of all others; four or more threads may be cut without affecting the rest.

It sews the book without passing the thread
(Continued on page 292.)

Scientific News,

PUBLISHED TWICE A MONTH BY
S. H. WALES & SON,
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SALAH H. WALES.

EDWARD H. WALES.

ILLUSTRATED

1880. **Scientific News,** 1880

WE have undertaken to supply a first-class, low-priced journal, devoted to Popular Science, the Mechanic Arts, Manufactures, New Inventions, Patents, Discoveries, Chemistry, Engineering and Technical Subjects generally.

We bring to this work an experience of more than twenty years, and it is our aim to present all subjects in plain, popular language, that the people may understand what they are reading. Each number will be fully illustrated with engravings. Independent of original sources of information, we shall also make liberal selections from all the best English, French and German scientific periodicals. In short, we intend to give every reader of the **ILLUSTRATED SCIENTIFIC NEWS** a large amount of useful reading for a very low price.

THE TERMS are one dollar a year. To this must be added 10 cents to prepay postage required by law. Total, \$1.10.

FIVE SUBSCRIBERS will be taken for \$4, to which must be added 50 cents to prepay postage. Total, \$4.50.

TEN SUBSCRIBERS will be taken for \$7, to which must be added \$1, to prepay postage. Total, \$8.

Whenever bank-bills are sent, the odd change can be made up in postage-stamps.

The best way to remit is either by postal order, or bank draft payable to our order.

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S. H. WALES & SON, PUBLISHERS,
 10 Spruce Street, New York.

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WE again ask attention to our cash and other valuable premiums mentioned in this issue of the paper. Whoever intends to compete for the cash premiums should send us notice of such intention. For the largest list of names sent in before February 1st, 1880, we offer \$100. For the second list \$50. For the third list \$25. Subscriptions may be sent in at any time before that date and from different Post Offices, to be taken at clubbing rates.

A Word to our Subscribers.

THIS number closes Volume two of the **SCIENTIFIC NEWS**, and with it terminates several thousand subscriptions, all of which we hope may be promptly renewed, together with the addition of many thousand new names. With the improvements to be made on the new volume, we shall be able greatly to enhance the value and character of the paper.

At one dollar and ten cents a year, the **SCIENTIFIC NEWS** will be the cheapest, and we modestly think, the best paper of its kind ever published.

If our friends will take hold and help to increase our circulation, it will stimulate us to add fresh attractions, and increased value and interest to the paper, and thus prepare the way for still further improvements for the succeeding year.

Our General Premiums. A Clearer Statement.

WE find that we failed to make our meaning clear in the paragraphs in our premium list at the bottom of the first column therein, which explain how those approximating a number of subscribers necessary to obtain a particular premium may obtain such premium if they prefer it to others in the list. We have therefore changed those paragraphs, and call the attention of our readers to the change.

Any one approximating a number of subscribers for which is offered a particular premium may send us whatever number of subscribers he can get, and the money collected for the same. This will entitle him to such part of any premium he may select as would be in proportion to the number of subscribers sent. Then by remitting, in addition to the money collected from the subscribers, the difference between the value of such proportional part of the premium and the price set against the premium he may obtain it.

For example, suppose a person to obtain only half as many subscribers as would entitle him to some particular premium. Then by sending the money collected for such subscriptions and half the price set against the premium he will be entitled to it.

Or suppose he obtains only one third as many subscribers as would entitle him to some particular premium. Then by sending the money collected for the subscriptions and two thirds the price of the premium, he will get it.

Answers to our wheel puzzle will be given in our next number, together with the original diagram, illustrating it.

WE are receiving gratifying assurances from various parts of the country that our friends are securing new subscribers for the forthcoming volume. Our next number—the first of the new volume—will be a handsome one. Orders for it should be sent in as early as possible. We expect to more than double our circulation before the 1st of February.

The column of *Industrial Wants* which we have recently started seems likely to prove very serviceable to our readers, any of whom may, without cost, avail themselves of its advantages under the conditions published at the head of the column, which see.

Shop and House Hints.

WE earnestly solicit our readers to communicate to this department, any items of industrial information that they may pick up in the pursuit of their business; more particularly, modes of over-

coming difficulties met with in the prosecution of any novel kind of work; recipes, which they have tried and found to be reliable, unexplained phenomena that may have puzzled them or their shopmates, engineering or mechanical practice not generally in vogue, but which has been found good in their experience. No matter how rude the language, or crude the sketches contained in these communications, we will undertake to put both into presentable shape, provided they are sufficient to give a clear understanding of the subject.

Bound Volumes.

WE are prepared to supply Volume two, bound in Cowen's patent binding. Price at the office \$1.50. Sent by mail, postage paid, \$1.75. This makes a handsome volume of valuable and useful information.

Scientific News.

FROM THE *Patriot*, HARTFORD, MASS.

WE have on our table a copy of the **ILLUSTRATED SCIENTIFIC NEWS**. It being the first number we ever saw, we naturally examined its contents closely, and was surprised to find the subject-matter covering so wide a field. We recommend it to our readers—those who are interested in Popular Science, Mechanic Arts, Manufactures, Engineering, New Inventions, etc., etc.—because of its low cost, the subscription being only one dollar and ten cents a year, including prepaid postage, and there is no other publication covering the same ground that can be had for less than three times that amount of money. It is handsomely illustrated and neatly printed. Address the publishers, S. H. Wales & Son, 10 Spruce street, New York City. They offer special inducements to getters-up of clubs.

Of Interest to Brewers.

IN the U. S. Court sitting at Milwaukee, Dec. 1st, Judge Iyer decided the case of Mathew Gottfried against the Philip Best Brewing Company, sustaining the complainant's patent. The decision is of great importance to brewers, as it makes them liable for royalty for the use of a process and apparatus for pitching the inner surface of kegs and barrels, which have been in operation in all large breweries for several years. The sum claimed by the plaintiff for infringement on his patent to date, and for royalty for future use, is not yet determined. It is understood that other large brewers, including those of Illinois and other States, have stipulated to abide by this decision, subject to its confirmation by the Supreme Court.

Here is an instance where a very simple invention is likely to prove of immense value to the patentee.

Our Index.

WHEN this number we print a carefully prepared index, by the aid of which ready reference may be had to any article published in the volume. We have indexed the department of Shop and House Hints by itself, to facilitate the finding of any of the valuable recipes, directions for manipulation, and other useful items which make up this valuable feature of our paper.

A glance at this index will show that a very great variety of useful matter has been supplied in this volume. It has been possible to give this variety only by dint of the most painstaking effort to condense every article to the smallest limits it would bear without lessening its value. By persistently pursuing this course, we have been able to treat as great a variety of subjects as usually find place in the larger and more expensive journals. As to the quality, the letters constantly received from our readers and our rapidly swelling subscription list amply testify to its general acceptability.

This encouraged, we shall commence the new volume, with the determination to constantly improve the character of the **SCIENTIFIC NEWS**, and spare neither labor nor expense to keep it in the foremost rank of journals of its class.

The Electrocyclo Engine.

Too late for an extended discussion in this issue, we have received in the *Journal of the Telegraph* an account of a new electro-magnetic engine, styled as in our heading by the inventor, Mr George Little.

The claims made for this invention are very important, and we are bound to say that they are made in such a manner as to give a strong impression of reality. The odor of charlatanism in which many so-called discoveries and inventions have recently been heralded, seems wanting

Mr. Little's statement. It is true, he is quite positive in his assertions, but he fortifies them by a tabulated statement of results attained by actual experiments in the presence of experts.

This statement shows an increase of lifting power of from seventy-five to one hundred times what has hitherto been attained in magnets, without increase in size of armatures or helices, when the current is generated by the consumption of zinc in a battery.

There is no clue to the construction of the engine given in the article except the title, and the following paraphrased, which we quote.

"In the electro-dynamo engine 'zinc energy' is brought into direct contact with 'coal energy,' and the full force or energy of the electro-magnet, divested of the well-known retardation, is made available by the utilization of the *extra* current, and that without deflection, as an additional source of energy, the bare armature itself being made to operate as a self-acting discharger of the magnet with any desired rapidity. That is to say, residual magnetism, heretofore an obstacle to power and speed, is, in this case, made to perform important work. This seeming paradox has been conceived in a way contrary to all preconceived ideas."

"In conclusion, I would say that the object and final issue of my investigations and experiments have been to eliminate and economically utilize the retarding forces, and devise an electro-dynamo engine that can be constructed so as to be capable of being propelled at great speed in either direction, and will be at the same time a self-acting brake."

We shall await with much interest further developments in regard to this invention. In its present stage it can hardly be made a subject of either adverse criticism or commendation. If Mr. Little has accomplished what he claims, he will at once rank among the foremost inventors of the age.

Expert Testimony as to Handwriting.

MR. GEO. H. STIMPSON, of No. 205 Broadway, New York, one of our ablest and most successful experts in chirography in this city or elsewhere, invited us recently to attend the probate of a will before the Surrogate, in this city. The will was disputed on the ground that it is a forgery.

The body of the will is written in a forward hand, and the signature is a back-hand. The attestation is in a different hand, but it is claimed by the disputants to the will, that the whole instrument, signature included, was written by one and the same hand.

The will was photographed, the negative being very much enlarged to illustrate better the peculiarities of the writing, and prints from this negative were exhibited in the Surrogate's Court. Mr. Stimpson was, we believe, the first to introduce this method of detecting forgeries, and confirming the genuineness of signatures.

The resemblances in the body of the will, the signature and the attestation were very striking, illustrating what seems to be a law of mind over muscle, namely, that the relation of certain strokes to others in writing will generally be the same no matter how much the writer may attempt to disguise his hand. In the case under consideration, this was exemplified in two ways. In the first place, the hair marks or up strokes of the letters t, d, h, etc., were uniformly begun at some distance from the bottom of the down or body-stroke and united with the down stroke only just before reaching the top of the latter. This was very characteristic and was strikingly shown in the three styles of writing.

Another peculiarity was that wherever a double letter occurred the second of the two letters was almost invariably the shorter of the two.

This description will only very inadequately convey the impression made upon the mind by the direct inspection of the photographs. Indefinable peculiarities also appeared which were found in each of the three specimens, and which are about as difficult to describe as would be the expression of a human face.

We saw enough to be convinced that this application of modern science is destined to prove a powerful means of furthering the ends of justice, in all cases where the genuineness of hand-writing is a matter of dispute.

Fair of the American Institute.

We shall complete our notes on this exhibition with the following remarks on steam pumps.

The display of steam-pumps this year was, as regards number, less than usual for exhibitions of the American Institute. The pumps exhibited were, however, very worthy exemplars of this branch of engineering.

The Niagara Steam Pump Works, of 118, 120 and 122 Myrtle Street, Brooklyn, N. Y., exhibited a line of the well-known, long-tried and highly-esteemed Niagara Direct-Acting Steam-Pumps. An improvement in the steam valve gear of one of

these pumps is all the change we noticed. This valve motion is very positive. We found it impossible to stop it on the centre under any conditions.

The great accessibility and simplicity of all parts of their pumps is a prominent merit. The water-valves can be reached, cleared from obstructions and replaced in half a minute. The water-valves are square spires, each side answering as a face, that may be brought into use as such by turning the valve to bring the side desired over the part. The valves are made of metal, but in an emergency a piece of wood, planed up square, may be temporarily used with equal effect. For safety pumps and wrecking purposes these pumps have been found superior, and for all the purposes to which pumps are applied they are admirably adapted.

In this inclosure was exhibited a deep-well steam-pump, running at extraordinary high speed for such a pump, the weight of the vertically reciprocating parts being counterbalanced. This was a very meritorious exhibit.

Another exhibit, shown by the same works, was a direct-acting duplex air pump, with an automatic regulator, by which the supply of steam was regulated in accordance with a predetermined air-pressure. That is to say, the steam-engine driving the pump was made to regulate the pressure, to maintain the required air-pressure in the reservoir. The regulation is very perfect, and the pressure as shown by gauge, was maintained with uniformity. The mechanism by which this is accomplished is extremely simple and reliable.

Mr. William Foster, No. 13 Adams St., Brooklyn, N. Y., exhibited a Direct Acting Steam-Pump having a very ingenious, simple and effective valve-gear. This pump is called the Excelsior Direct Acting Steam-Pump, and may be run at the highest speed possible for such pumps without any danger of pounding. In fact, its action is the freest from noise of any of this class of pumps known to us. This pump has now been on the market long enough to be tested under conditions fully proving its reliability and effectiveness. In one instance it has worked six months, raising water two hundred feet, from an iron mine, with no attention except oiling. It is an admirable boiler feeder. It has no dead centres, and starts from any part of the stroke. It is made by the Welltown Excelsior Compensating Suction and Rotary Pump, long manufactured by Mr. Foster, was also one of his exhibits. This is one of the best if not the best of its class. It is too well known to need a description here.

The N. w. Organ for the Cathedral at Garden City.

SOME of our readers remote from this city may be reminded of the following facts: The late A. T. Stewart, some years before his death, purchased a tract of land known as the Hempstead Plains, on Long Island. The town received the name "Garden City," and Mr. Stewart spent large sums of money in improving it.

Since his death there has been created a magnificent church, which is intended to be a sort of memorial. Mrs. Stewart has made the completion and adornment of this church one of the chief objects of her life since the death of Mr. Stewart.

It is to the grand organ now in process of construction for the cathedral that we propose to devote this article. This instrument will be one of the largest in the world, and will be very remarkable in many respects. It is expected that it will cost about forty thousand dollars. Mr. Hilborne A. Roosevelt is the builder.

It will be placed in four different parts of the Cathedral. The main body of the instrument will stand in the chancel, and the organist will sit there. At the west end of the building, in a tower flanked by two large stained-glass windows, is a room in which a part of the organ will be placed, and connected with the chancel by electricity, like the organ built by Mr. Roosevelt in Grace Church, New York. The window will be opened and closed by electricity, controlled by the organist, so that in monotonous instrument, and undisturbed, as a dimming effect with the organ in the tower. Over the ceiling, about the centre of the building, will be placed another part of the instrument, called the echo organ, which is to be played from the chancel by electricity. Underneath the chancel, in the chapel situated there, is a part of the organ, which is arranged so that it can be played in the chapel as well as from the chancel. Lastly, the large chimneys which hang in the tower will be connected with the chancel by electricity, so that the organist can play them from the keys of the organ. The bellows will be operated by hydraulic engines, and the organist can, by simply turning on the water, have the whole instrument, including the chimneys, at his command. Though this will be from monotonous instrument, and undisturbed, as a dimming effect with the organ in the tower, the great distance between many of its parts, the

pressure necessary to play on the keys will be no greater than is used in playing upon a piano. This is due to the use of electricity, pneumatics and hydraulics, which, combined, render it possible and practicable to construct such an instrument.

There will be four vox humanas (similar in construction to the celebrated one in Freiburg); one of these will be in the chancel, one in the tower, another over the ceiling, and a fourth one in the chapel beneath the chancel. All of these will be under the control of the organist in the chancel, and will be capable of crescendo and diminuendo effects. Certainly some beautiful and extraordinary combinations can be produced with their aid. In all there will be one hundred or one hundred and twenty stops, the exact number not yet having been determined upon. The Boston Music Hall organ has eighty-four stops, the Cincinnati organ ninety-six, and the largest organ in the world, that in Albert Hall, London, one hundred and eleven. Five hydraulic engines will be needed. Quite a small Gramme magneto machine will furnish all the electricity necessary. Where mechanical force is required, as in ringing bells or opening windows, compressed air will be used in an ingenious manner, devised by Mr. Roosevelt.

Music in Stones.

AN exhibition was given in this city by Mr. Baudré of a novel musical instrument, which at first sight resembled a shelf of geological specimens.

The sounds emitted from it resembled in a degree those made by the tinkling of glass, and also those of the instrument called a "metallophone." The bass notes were like the sounds of sheep bells heard at a distance. The general effect was that of a musical geological specimen. The stones were of various sizes and shapes, some were oblong, irregularly shaped flints. They had never been touched by fire, saw or chisel. The collection ranged from D in the bass to upper E sharp, over two octaves, with sharps and flats. Most of those in the music scale, the flints were petrified bones, from their length, and the fact that a majority of them were larger at the ends than in the middle. A close inspection, however, showed that they were irregular throughout. With the exception of one or two, they present a natural surface in all their parts. In some cases the surface was flat, as if a portion of the stone had been split off, but the flat surface was evidently many years old, probably many centuries. The longest of the stones was about a foot long, and much resembling a musical instrument. The smallest was about three inches. What appeared to be a shelf was a sounding board about an inch below them. They hung so near together that when Mr. Baudré began to explain them in French and accidentally touched one with his hand, several of them tinkled together like the glass prisms in a chandelier.

Two bars of wood six feet long extended above the sounding board. The flints were swung from these bars side by side transversely to the bars. A string was attached to the middle of each flint and fastened to the bar on its own side of the instrument. Mr. Baudré, when he played upon it, struck the suspended stones with two smaller stones, one held in each hand. These smaller stones were of the same material as the flints, well-known iron was very generally commended by all who heard it, especially the quality of the sounds produced.

In color the stones were a dull gray, blotched here and there with white. In his explanation of his novel instrument, Mr. Baudré said it was a remarkable advance in the science of geology to make stones speak. It had been very difficult, he said, to find the exact qualities required; for though the cutting or breaking of a stone would alter its position in the musical scale, it was not destroy its existence as a singing stone, yet it almost destroyed the purity of its notes. It was emphatically true, he said, in this case, in the words of the Scripture, that many were called and few chosen. He said the first musical sound he now had in his instrument in 1851, and the last one in 1875. For twenty-four years he had labored before he had filled in all the notes and half notes. All the stones were found either in the chalk or iron districts of France. The last stone was found at Beauvais. He said the first musical sound Adam heard might have been from one flint falling upon another. Before bells came into use, singing stones were employed, but never until now were stones arranged in a scale.

CEMENT FOR MARINE AQUARIUM.—For the glass, red and white lead mixed to putty with boiled oil. For the rock-work the same, or Portland cement. All the seams should be painted on the inside with gold size; zinc must not be used for a salt water tank.

(Continued from page 289.)

through the back, and is capable of doing "full sewing" by a simple adjustment of the feed. The stitch is very strong. The machine can sew at the rate of a signature per second, and will sew a book of any length of back within the compass of its supporting-bar. One or more of its pairs of needles will operate with as much certainty as all four pairs together. It will sew any book up to eight inches in thickness. All its parts work by positive motions. They are simple, easily made, and easily replaced when worn or injured. The machine requires little or no attention. The attendant may be a child. Skilled labor for hand-sewing is thus dispensed with. The automatic tension governs the thread perfectly. Each pair of stitches being entirely independent of all others, a book of blank pages may be cut into as many smaller volumes as there are pairs. In this way, on an eight-spoke machine, diaries or other small blank books may be sewn four at a time and afterwards cut apart.

Where England Gets Her Gold.

TRULY this is a period of great revolutions. For a very long period it has been true that, in some mysterious manner, oriental countries absorbed a very large proportion of the gold producing regions of the American continent. A constant stream of gold set eastward, and was absorbed in Asia. Now it would seem the tide is, turning in the opposite direction.

The following paragraph, extracted from the *Economist* for November, states, and which are probably known to very few of our readers. It is, of course, well known that gold has been shipped to this country during the past autumn in unprecedented quantities, but it is not known that this now reaches beyond Europe, and that it has averaged a million of dollars per day for sixty days together, and the indications point to its continuance for some time to come.

The *Economist* says: "At the present moment there is, undoubtedly, a deficiency in the amount of gold required for the commerce of the civilized world, and we have contributed largely to this deficiency of late, by our reserve of at least three hundred millions in gold for re-emption, drawn chiefly from our own mines, but to a larger extent during the Southern insurrection, when we withheld the cotton, but parted with our gold and silver, which England at once dispatched to India for cotton. For the same part, such fabulous prices that, in one instance, less than the natives of India shod their cart-wheels with silver. Having no coinage of gold, they desired silver, which they coined at once into rupees, or fashioned into ornaments for their women, and when they could obtain no more silver they took gold, which they converted into decorations also; and now, when famine or land agents draw hard upon their resources, they exchange their gold ornaments for silver, and the gold is sent down into India, and is remitted to England. At this moment she finds one of the most prolific gold mines in the female population of India."

This demand for gold has had its effect upon silver, which has risen 54 per cent per ounce in the London market since July, 1877, and is still trending upward, with a diminished supply from American mines.

It seems to be as certain for finance, as for all else, that everything has its compensations.

Trade-marks in Congress.

SINCE the decision of the Supreme Court declaring invalid the law of Congress under which trade-marks were protected, the subject has been widely discussed. It is gratifying to notice the deep interest the people of the whole country feel in this matter. It is therefore with special pleasure we mention the fact that Representative McCord has proposed to the House the following additional article to the Constitution: "Congress, for the protection of trade and manufacture, and to carry into effect international treaties, shall have power to grant, protect, and regulate the exclusive right to use trade-marks."

Should this article pass Congress in time, there appears to us no good reason why the requisite number of states should not ratify it this year. Congress may then legislate to protect the rights of those who have already secured patents for trade-marks.

THE WELL KNOWN OTIS ELEVATOR was not the one the fall of which in the New York P. O. we announced in our last issue. We have never heard of a serious accident with an Otis Elevator yet, and believe that, in their construction, every possible casualty has been thoroughly provided against. The advertisement of Otis, Bros. & Co., who manufacture these excellent elevators, appears as a new-comer in our advertising columns of this issue. We invite the attention of our readers to it.

Climatic Effects of Forests.

OBSERVATIONS made during the last six years under trees and not far from the edge of a forest, and also in the plain remote from trees, lead to the following conclusions:

First—Forests increase the quantity of meteoric waters which fall on the ground, and thus favor the growth of springs and of underground waters. Second—In a forest region the ground receives as much and more water under cover of the trees than the uncovered ground of regions with little or no wood.

Third—The cover of the trees of a forest diminishes to a large degree the evaporation of the water received by the ground, and thus contributes to the maintenance of the moisture of the latter, and to the regularity of the flow of the water sources.

Fourth—The temperature in a forest is much less unequal than in the open, although, on the whole, it may be a little lower; but the minima are there considerably higher and the maxima lower than in regions not covered with wood.

These observations have been made in the neighborhood of Nancy, and by the pupils of the School of Forestry of that city, under the direction of M. Mathieu, sub-director of the school. On the other hand, M. Faust, then Sub-Inspector of Forests at Senlis, made during four years, but on a different method, observations on forestal meteorology which fully and completely corroborate in certain respects those of M. Mathieu. The laws which seem to follow from the figures given by M. Faust, as well as an inspection of the curves which graphically represent them, are as follows:

First—It rains more abundantly, under identical circumstances, over forests than over non-wooded ground, and most abundantly over forests with trees in a green condition.

Second—The degree of saturation of the air by moisture is greater above forests than over non-wooded grounds, and much greater over forests of *Pinus sylvestris* than over masses of leaved species.

Third—The leafage and branches of leaved trees intercept one-third, and those of the resinous trees the half of the rain water, which afterwards returns to the atmosphere by evaporation. On the other hand, these same leaves and branches restrain the evaporation of the water from the ground, so that the evaporation is nearly four times less under a mass of leaved forest than in the open, and one and one-third times only under a mass of pines.

Fourth—The laws of the change of temperature over forests and over wood are similar to those which result from the observations of M. Mathieu.

The Wave Theory of Sound.

WAVE LENGTHS.—VIBRATIONS OF PLATES.—PIESOMONA AT NIAGARA FALLS.—THE WAVE THEORY COMBATED BY EXPERIMENTS.

—ALMOST A SCENE.—THE STRIDULATIONS AND THE KICK OF A CRICKET.

Dr. Vanderweyde, at a late meeting of the Polytechnic Institute, gave an exposition of the principles of sound on the wave theory.

"Stretch a piece of string across the room," said he, "and it vibrates like a pendulum, but by elasticity, not by gravitation. Experience shows that the shorter and tenser a string is, the faster it vibrates; and the longer and laxer it is, the slower. The rule for the rate of vibration is that, other things being the same, it is inversely proportional to the length of the string. As soon as the vibrations become so quick that they cannot be counted sound becomes tone. Long C is produced by 64 vibrations in a second, and every halving of the string gives an octave higher. The highest note of the soprano corresponds to 1024 vibrations in a second, and is executed by a little membrane in the glottis. The telephonic and phonetic are wonderful vibrations, but the connection of the human ear with the vocal organs is more wonderful."

The speaker had a theory of light and sound which made the seven prismatic colors correspond to the seven tones of the musical scale, but the theory, it may be remarked, is nothing new. He illustrated his remarks by references to several musical charts, including a diagram of the keyboard of a piano, hung on the wall. In an organ it is the reed column that vibrates, not the pipe, as the pipe may be of cast iron or any other material and the tone will be the same. He supposed the sound waves to traverse the pipe, from one end to the other.

Sound travels in air nearly 1100 feet per second, the velocity depending to some extent on temperature and the condition of the barometer; he would say 1024 feet to avoid fractions. The number of vibrations in a second is the number of waves in motion in that time; and if the number of waves is set in motion by, say 64, then when the first, or advance wave has reached the distance of 1,024 feet, the last, or 64th wave, will have just started; and so that the whole 64 waves cover the distance of

1024 feet, and the length of a single wave will be 1024—64=16 feet. In general the length of a sound wave will be 1,024 feet divided by the number of vibrations in a second. In this manner the length of the waves of low C, before alluded to, is seen to be 16 feet each. The highest note of the soprano (1024 vibrations in a second) has a wave length of 1024—1024=1 foot. The length of a wave is the distance between its crests, or its peaks, and that of the next succeeding one. (The preceding, relating to wave lengths, is entirely by the writer, Dr. Vanderweyde not being very clear upon the subject.)

The vibration of plates presents some curious phenomena. If a long rectangular slip of glass or metal is made to vibrate, two points are found to be at rest. These are called nodes, and are nearly a quarter of the length of the plate from each end. If a square plate is thrown into vibration, the diagonals are found to be at rest, and the mode of vibration is this: two opposing triangular quarters of the plate go down while the other two go up, and *vice versa*. If sand be put on such a plate, the sand will be thrown off, except along the diagonals. Put sand on a glass plate, and strike the plate with a bow; the sand will be thrown into curious figures, called "Chladni's sound figures."

In the human voice there are very low tones. The speaker was once at Niagara Falls, quartered at a hotel on the Canadian shore, close to the famous Horseshoe. When out of the sound of the foam, and within hearing only of the fall into the abyss, the water was very deep, and suddenly there came a clap of thunder, to the tone of which that of the waterfall seemed to be a treble.

There is a well known experiment in physics for illustrating the velocity of the electric spark. In a dark room, take a watch revolving very fast, making, say, 1,000 revolutions a second. Charge an electric jar, and draw forth a spark. As it illuminates the wheel, the latter, though revolving with such enormous rapidity, seems for an instant to be at rest, so great is the velocity of the spark. At Niagara Falls Dr. Vanderweyde was fortunate enough to witness a similar effect on a grand scale. It was night, and the vast sheet of descending water, illuminated for an instant by the lightning flash, seemed perfectly motionless, as if suddenly arrested in its descent and held as a solid wall. If the lightning-burst consist of two flashes, as often occurs, then change is perceptible. Dr. Vanderweyde tabulated as follows the

SOUNDS AUDIBLE IN NIAGARA FALLS.

Sol, 88 vibrations in a second.

Do, 126.6 " " "

Do, 132 " " "

Sol, 176 " " "

Do, 211.2 " " "

Do, 264 " " "

Sol, 328 " " "

Do, 422.4 " " "

Sol, 525 " " "

Sol, 734 " " "

Do, 844.8 " " "

Do, 1056 " " "

(In the above table, the rate at which sound travels per second seems to be taken as 1056 feet.)

Professor Hall determinedly opposed the wave theory. He produced two little instruments tuned in unison, so as to sound the note which is the middle A of the piano, a note with a wave length, he said, of about 30 inches and which corresponds to about 40 vibrations in a second. He placed the two instruments in unison, and then referred to Dr. Tyndall as saying that the two instruments so placed, if sounded together, ought, on the wave theory, to neutralize each other on the principle of the interference of sound waves.

Dr. Vanderweyde, emphatically: "Dr. Tyndall says no such thing."

Prof. Hall: "He does."

Dr. Vanderweyde: "He doesn't."

Prof. Hall offered to read Dr. Tyndall's *primaries* upon the subject, and the lecture was proceeding when the chairman interfered and stopped what was likely to be a scene, by ruling out Dr. Tyndall and directing each speaker to confine his words to the simple delivery of his own opinions.

Prof. Hall seemed much mortified at being interdicted from appealing to Tyndall, but continued to say that if there was any truth in the wave theory, his two instruments, if blown at once, ought either to increase or kill each other. He said that he had come there particularly to challenge Dr. Vanderweyde to defend his theory either there or in any public hall he might mention. Prof. Hall then put the rubber tubes communicating with his instruments to his mouth, and blew a long and vigorous blast. The instruments responded simultaneously and with sameness, as it appeared, to the great interest of the audience.

Dr. Vanderweyde: "Why, they are both the same."

Prof. Hall: "Yes; there is no difference, hence, no waves. The wave theory teaches that sound waves, like water waves, interfere with one another, that the construction of one system falling into the refractions of another, the two systems destroy. This, if properly understood, settles the whole question."

Dr. Vanderweyde, on second thought, saw in the performance of the two instruments only a continuation of the wave theory. It was not to be expected that with such high-toned sounds involving such rapid vibrations anything decisive could be proved. It must be with the very lowest tones that such experiments must be made to be adapted to the capacities of the ear. Besides, he could actually detect a slight intermittent *tarr-r* or *whiz* in the joint sound of the instruments which showed that they were not going with perfect ease together; in short, he could see that there was an appreciable interference.

Mr. Neumann had heard it said that a tuning fork in Italy was different from one in St. Petersburg. Was that true or had latitude anything to do with it?

Dr. Vanderweyde said it was not true. A tuning fork in Paris has just the same pitch as one in London. He had noticed once that a Paris tuning fork when brought over here did not accord perfectly with those in use in New York. The difference, however, was less than a quarter of a tone. He attributed it to the effect of temperature. In the case of a tuning fork, if the temperature is higher the vibrations are slower because it expands by heat. The same cause makes a difference in the instruments of an orchestra. A rise in temperature makes wind instruments go up and stringed instruments go down.

A gentleman said that the variation was only .01 per cent. for a variation of 75 degrees in temperature.

Mr. Blanchard said that the wave theory was charged with producing a vast amount of dynamic force. According to that theory the stridulations of a cricket, it might be said, would engender a dynamic force equal to that of many thousands of locomotives. He did not believe in measuring power by pounds. If a cricket jumped from the earth he kicked the earth away from him, and the only question was, If there were organisms sufficiently acute on the other side of the earth to feel it. It appeared to him that the argument founded on the alleged great expenditure of dynamic force was entirely fallacious. The other theory of sound is the emanation theory.

Mr. Roosevelt: "It is related of Demosthenes, that the once came into the forum, and finding the people listening intently, asked, 'What foolish thing has been said?' It can be demonstrated mathematically exactly how much this strain is moved by the kick of a cricket. It is a question with the most advanced philosophers of the present day whether we are not moving in a substance more impenetrable than diamond, because it goes through diamond. We see it in the vibrations of the stars."

Dr. Vanderweyde stated what seemed to him the greatest objection to the wave theory. It is that the sun is apparently the origin and cause of all the changes in matter, and all the activities around us. The ether, then, or medium through which he is constantly communicating his influence ought, one would suppose, to be as thick as cheese.

M. POWERS.

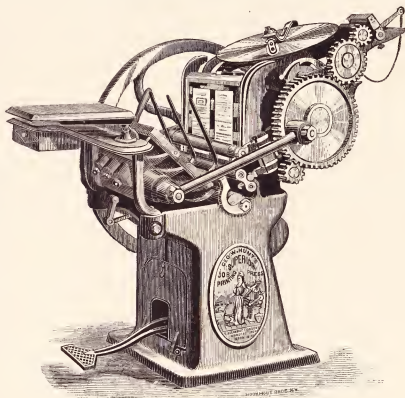
There is a prevailing tendency among men eminent for scientific learning to throw discredit upon portions of the Bible. It should always be borne in mind that scientific men are not authorities on moral laws, any more than the Bible is an authority on physical laws. Professor Goldwin Smith declares that the present tendency of things is towards rapid breaking down of the notions and dogmas. We do not doubt that there is foundation for such a statement, but it forbodes no good to the world. Much better for the community is it, when the people build upon the foundations of the apostles and prophets, rather than follow the notions and vague speculations of scientific men, whose minds are naturally subject to material bias.

Hunt's "Superior" Job Printing Press.

THE accompanying engraving illustrates a new printing press for job work, exhibited at the American Institute Fair of this year, by the manufacturers, E. Kennington and Sons, whose celebrated works are at 281, 283 Broadway, in this city. There are several novel features of interest in this machine, the most important of which is the automatic brayer and distributor, whereby a very uniform distribution of ink is effected.

The frame of the press is so formed that its interior may be used as a closet. Acting in conjunction with the automatic brayer, there is a form roller throw-off, which prevents an over supply of ink to the form. Ordinarily, as job presses are constructed, the inking of the form continues while the impression is off, and printing suspended, unless the form is taken out, or the motion of the press discontinued. This subjects the operator to all the attendant disadvantages which are entirely overcome by the throw-off. It is operated by the same lever that regulates and throws off the impression; or, by means of the same lever, the inking rollers may be made to pass continuously over the form while the impression is suspended, where extra rolling is required.

This press also differs from ordinary job presses in the method of carrying the inking rollers. Common hooks are discarded, and solid-head roller carriers substituted. These latter are very easy to adjust, but firmly set when the rollers are in position.



THE "SUPERIOR" JOB PRINTING PRESS.

The grippers are also mounted in such a manner that they are always in the right position. In setting them they can be moved up to the form and secured accurately, or drawn back and down upon the tympan, as may be required.

Another important feature, and a great improvement over the usual method, is the manner in which the platen is held in its position. Usually the platen is mounted upon the front projecting ends of the impression screws, which, from continual strain in use, become shaky and uncertain. In the "Superior" Press the rear of the platen is shut into the beam or support, like a box into its cover, and its weight and dependence upon the impression screws for support entirely removed. These screws simply bear against the inserted back of the platen, while the platen is held firmly against them by strong holding-down bolts, which makes the platen a solid part of the beam itself, and entirely freed from all liability to slurr, or to give way under the impression. The principal shafts of this press are entirely cased in cast-iron sleeves of great strength; these receive the strain of the impression. A strong and broad iron brace, projecting from one of these sleeve casings, holds the bed and adjusts it in position to receive, or withdraws it from, the impression.

The tables of this press, including a drawer, are of black walnut, and cabinet finished. The working parts are, very strong and well made, and bright finished, the smaller parts nickel-plated.

Animal Tool Makers.

MR. S. E. PEAL writing to *Nature* upon the subject of Intellect in Brutes, denies the truth of the assertion made by the Duke of Argyll, that "man is the only tool-making animal." He says: "As far as I can ascertain, this assertion is admitted by developmentists, yet it is undoubtedly true that the Indian elephant makes two implements, or forms and alters certain things so as to adapt them specially to fulfill definite purposes, for which, unaltered, they would not be suitable.

"One evening, soon after my arrival in Eastern Assam, and while the five elephants were as usual being fed opposite the Bungalow, I observed a young and lately caught one step up to a bamboo-stake fence and quietly pull one of the stakes up. Placing it under foot, it broke a piece off with the trunk, and after lifting it to its mouth, threw it away. It repeated this twice or thrice, and then drew another stake and began again. Seeing that the bamboo was old and dry, I asked the reason of this, and was told to wait and see what it would do. At last it seemed to get a piece that suited, and holding it in the trunk firmly, and stepping the left fore-leg well forward, passed the piece of bamboo under the armpit, so to speak, and began to scratch with some force. My men, who were at hand, then saw the elephant make a hole in the ground, quite six inches long and thick as one's finger, and which, from its position, could not easily be detached without this scraper, or scratch, which was deliberately made by the elephant. I subsequently found that it was a common occurrence. Leech-scrappers are used by every elephant daily.

"On another occasion, when traveling at a time of year when the large flies are so tormenting to an elephant, I noticed that the one I rode had no fan or wisp to beat them off with. The mahout, at my order, slackened pace and allowed her to go to the side of the road, where for some moments she moved along rummaging the small branches of a tree, and finally stripped down the stem, taking off all the lower branches and leaving a fine bunch on top. She deliberately cleaned it down several times, and then laying hold at the lower end broke off a beautiful fan or switch about five feet long, handle included. With this she kept the flies at bay as machines used in the same way, flapping them off on each side every now and then."

"Say what we may, these are both really *bona-fide* implements, each intelligently made for a definite purpose."

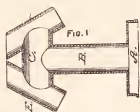
A HEAD of Titus, also other ancient sculpture, has been unearthed by the German explorers excavating at Olympia.

Artificial Slates.

SLABS of artificial slate for writing purposes or other uses are prepared by the United Harberg and Vienna India-rubber Works, a process of which the following is an outline: Sixteen parts of ground pumice-stone and twenty-one parts of powdered bone charcoal, all mixed with ten parts of purified India-rubber and five parts of sulphur in the machines used in the ordinary operations of the rubber works; and the mass is then rolled out into thin leaves, which are cut to the required size and pasted together, as follows: First, a sheet of tin-plate, then a layer of paper, then a sheet of the above preparation, another sheet of paper and a second tin-plate, the operation being repeated in the same order as often as may be deemed necessary. The whole pile is then pressed together, put into a boiler and there exposed for 2½ hours in a temperature of 130° to 140° C. by means of steam. The packets are then taken out, and each layer of the composition, together with the sheet of paper on each of its surfaces, is pressed strongly between steam-heated plates, and again exposed to a temperature of 130° to 140° C. for about two hours. When cooled down, the sheets thus prepared are polished with pumice-stone, and are then ready for use.

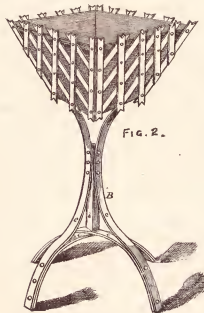
Recently Patented Inventions.

A chimney-top and ventilator, shown in Fig. 13, is the invention of George E. Barker, of Waverly, N. Y. It consists in a cap, A, adapted to fit over the top of a chimney, having the pipe, B, the hori-



zontal pipe, C, extending across said pipe, B, and having its central portion communicating therewith, whereby when the air currents are horizontal the smoke will be discharged upward through one of the pipes, E, but when downwards through the lower ends.

The work-basket stand, invented by Mr. John W. Wolcott, and shown in Fig. 2, consists of the centre-post *A*, curved, supporting splint *c*, and curved and crossed bracing splints *e*. The construction affords a cheap, strong and tasteful article of furniture.



In Fig. 4 is shown an automatic cigar-lighter, the invention of Mr. Charles Crook, of Brooklyn, N. Y. This automaton is made by ingenious interior mechanism driven by clock-work to perform the following operations:



An articulated arm carrying a sponge is drawn from an alcohol-cup, inserted in the flame of a burner, and then extended to full length during a short interval, and is then returned to the cup, and the flame extinguished. A knife, actuated by a spiral spring, which is extended by a cam on the main shaft, is released, and clips off the end of the cigar. The mechanism operates during an entire revolution of the main shaft, and serves thereby to light a single cigar.

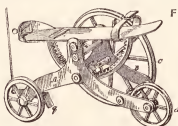
Mr. John Ashcroft, of Brooklyn, N. Y., a well-known steam engineer and inventor, has patented the grate-bar for furnaces, illustrated in Fig. 5. These bars are hollow, and perforated to permit

the circulation of air into and through them at all points, thus keeping the bars cool and affording a very thorough and uniformly distributed supply of air to the fuel. The bars have at least two of their faces concave (all four faces are so formed in the



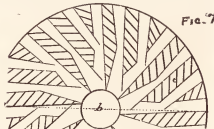
engraving). This construction permits the bars to be placed quite near together, and yet allows rotation on their longitudinal axes, the angle of each bar entering the concavity of the adjacent bar. We think this grate-bar is destined to win a wide popularity.

In Fig. 6, is shown a pedo-motor or device intended to be strapped to the feet, to support the person, and operated by the motion of the foot at the ankle joint. C, is the driving-wheel, the shaft of which has a pinion and pawl motion which permits the pinion to propel the wheel C, only when turning in one direction. The foot plate is pivoted



to the wheel-frame and has a segmental rack which operates the pinion on the shaft of the wheel C. When the weight is thrown upon the toe of the foot-plate it is depressed and the driving wheel is turned to move the whole apparatus and its load forward. By means of a cord *r*, a brake *y* is applied to one of the carrying wheels, *a*, whenever it is desired to come to a stop or to retard the motion.

Mr. William C. Hale, of Austin's Springs, Tenn., has invented an improvement in Millstone Dresses, shown in Fig. 7. It consists in the radial and tangential furrows *c c*, made widest at their ends and narrowest at their centers, and running into



each other at the eye of the stone, as shown, whereby the grain freely enters into the furrows at their inner ends, is held back by the contraction at their centers until sufficiently reduced, and then given a speedy discharge.

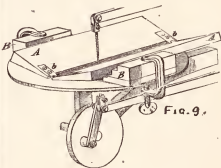
The fire escape illustrated in Fig. 8, will, we think, impress most people as not only an elegant but a delightful means of letting one's self down easy. The sensation of being suspended in mid-air by the neck in the manner shown (which, judging by the complacency of kittens, when so carried by



the maternal cat, cannot be otherwise than delightful) may now by this very ingenious device, be en-

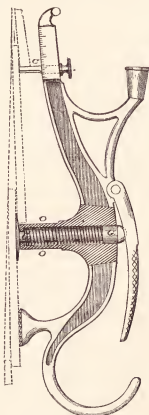
joyed by persons of any age, sex or color, without the disastrous consequences which would attend it were only a rope used. The alighting, which Pat says, is what hurts one in falling, is in this invention provided against by comfortable and graceful cushions of ample thickness applied to the feet. The velocity of descent is indicated by the upturned coat-tails. Given the specific gravity and cubical contents of the coat-tails, the temperature and barometrical pressure of the atmosphere, and the angle of elevation of the coat-tails, the velocity of descent which the inventor considers safe when the feet are well padded, and an imploring trust reposed in Providence, (well depicted in the engraving,) may be easily computed. The patentee of this ingenious and scientific device, is Mr. Benjamin B. Oppenheimer of Trenton, Tenn.

A mitring attachment for sawing-machines, invented by Mr. Elbridge G. Holden, of Philadelphia, Pa., is shown in Fig. 9. A removable mitre-trough consists of two guide plates, A, upon opposite sides of the saw and adjustable to any desired



angle. Side supports B, are used in combination with the plates A. These side supports are stepped, by which means the outer edges of the plates A, are supported in higher or lower positions as desired, and they are held to the table of the saw by clamps.

The weather-board gauge shown in Fig. 10, is the invention of Mr. Joseph D. Hobbs, Mediapolis, Iowa. This is a handy tool, designed as a substitute for the ordinary weather-board gauge, over which it has advantages. Its use will be sufficiently obvious by an inspection of the engraving and an enumeration of the parts, which are, a weather-board gauge, brace-post with pyramidal-projection



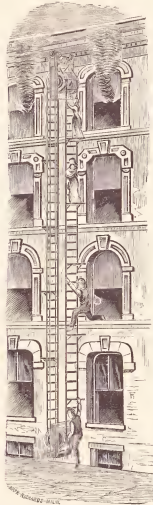
base, cylinder O O, extending in same direction as the brace-post, with loose vertical shaft therein, with shaft encircled by spiral spring the length of the cylinder, circular plate at base of shaft, lever working on the head of the plate, an adjustable bolt or gauge C in graduated slotted scale, and socket with tapering mouth.

Curtis' Improved Fire Escape.

THIS invention commends itself to practical minds for the following reasons:

It is made wholly of iron. It can be used with perfect safety by a number of people at once. It is accessible while in motion. It requires no adjustment by the person desiring to escape. Its motion is controllable by the person or persons descending. It may be used as an elevator for fire extinguishing apparatus.

The escape is simply an endless ladder moving over pulleys and passing just by the side of the windows, from the top of the building to the ground. Thus to escape, one needs merely to step from a



window on the ladder, when without further effort, or even change of position, his own weight carries him speedily to the ground. Children or even invalids can escape with perfect ease. The steps attached to some of the rounds make the footing easy. The rate of descent can be regulated from any point of the ladder, by means of the hand rope passing its whole length connected with the gear wheels at the top, the horizontal one of each set acting as a nut, drawing up the threaded end of the band brake which passes around the pulley. Two other similar brakes are at the bottom, worked by a hand wheel.

The apparatus as thus described has been improved by the addition of an ingenious house which incloses the lower part of the ladder, and which cannot be opened from the outside. It is so arranged that the first downward movement of the ladder causes the roof, made like a trap door, to fall to the side of the building, and at the same time opens a door in the side of the house.

Mr. Curtis informs us that recent improvements enable him to hoist firemen with their hose, etc., to any part of a building, thus enabling them to extinguish fires before they attain headway.

The invention is adapted to very high buildings such as factories, hotels, tenement houses, etc., as well as to lower structures.

The first patent issued for this invention bears date June 4th, 1878. A second patent for the improvements named is dated October, 21st, 1879. The address of the inventor and sole proprietor, is Mr. O. H. Curtis, No. 130 Third Street, Milwaukee, Wisconsin. He will dispose of territory, rights to make and use or afford any other information on application.

Leather Cogwheels.

MR. F. KUNKEL, of Meringen, in Wurttemberg, has patented a process for making toothed wheels of leather in place of metal. The advantages claimed for them are that they have a much quieter and more elastic run, are extremely durable, and require no lubrication whatever. They are prepared from raw untanned buffalo hides, thoroughly cleansed from all hair, flesh, etc., and glued together in as many layers as are necessary to produce the breadth of wheel required. The cement is effected under very heavy pressure, as in a hydraulic press, and this is kept up until the glue has completely hardened. From the sheets or plates thus prepared the teeth are cut out by saw and chisel.

Holiday Magic.

A WRITER in the New York *Sun* has recently devoted an article to the numerous toys now on the market for the performance of conjurers' tricks. Describing some that were exhibited by a performing salesman, he says:

"The first exhibition was of an enchanted tumbler, or rather a large wineglass. The glass simple was just like any other wineglass. It was turned upside down and thoroughly examined. There was certainly no trick in the glass itself. A little water was poured into it, and it was placed on a table; a handkerchief and a half dollar were borrowed. Then the half dollar being placed in the centre of the handkerchief, the performer requested the representative of the *Sun* to grasp the half dollar, and holding the handkerchief over the glass to drop the coin herefrom into the wineglass. The coin was dropped, splashed into the water apparently, settled on the bottom of the glass with a silvery click, the handkerchief was removed and behold! there was nothing but the water in the glass. The coin had disappeared.

"Where shall I find it?" asked the performer. "I will produce it from any place in the room you may choose."

From under the table, then, was requested. From under the table the performer drew out the half dollar.

A hat was next taken up by the salesman, and he, seemingly by main force, using both hands in the operation, thrust one of his fingers through the crown of the hat. Then withdrawing the finger with almost as much force apparently required for the act, he held up the hat uninjured.

Then the salesman borrowed a pocket-handkerchief, which he burned up in a polished brass globe, and put the globe containing the ashes in the hand of a spectator. The top of the globe was then placed on it, and the holder requested to open it. He did so, and found the handkerchief within, restored, and not even marked by the fire.



FIG. 1

He next ignited a mass of tow, in full view of the few spectators, crammed it into his mouth, and, growling as if in great pain, breathed out sparks and smoke for a few seconds. Next he took up a small handkerchief, and raising it by the centre from the table, drew from under it, eggs, boxes, rings, toys of various kinds, and unnumbered queer things.

But the greatest thing of all that this wizard salesman did was with another borrowed hat, an ordinary silk hat, with a kid or morocco lining, such as any silk hat has. He pulled the lining out, and, diving with his hand into the depths of the hat he drew forth, one by one, one dozen oblong square satchels, or reticules, each one so large as to

be apparently drawn forth with difficulty through the hat and its lining. This was done, too, with great rapidity, the whole feat being performed in less time than it takes to write, or even read, the account of the same."

In another publication we find a description of a magic bottle, by means of which any one of five different liquids may be poured from the same bottle.

The bottle is usually made of tin, though colored on the outer surface to represent glass. Within, it contains several different receptacles, as shown in Fig. 1, each communicating by a separate pipe with the mouth of the bottle. Each of these receptacles is also provided with another tube, by which air may be admitted, so as to al-



FIG. 2

low the liquid contained in it to flow. These air tubes open by orifices in the side of the bottle, as shown in Fig. 2, which are covered and concealed by the thumb and the ends of the fingers of the operator, and may be kept closed or may be slightly opened at pleasure. By this means any one of five different liquids may be poured from the mouth of the bottle.

Electroscopes and Electrometers

BY EDWARD E. MACGOVERN, STEVENS INSTITUTE.

THE term electroscope is derived from the Greek, and signifies "a measurer of electricity." The term is applied to instruments for detecting the presence and determining the kind of electricity, whether positive or negative, in a body. They can be divided into two general classes:

1st. Those intended for "static electricity."

2d. Those intended for "dynamic electricity."

The most simple kind of electroscopes are those of the common pith or cork, silk suspended and insulated by a silk thread. In this, as in all other of like appliances, we can trace the gradual improvement until we have reached, at least as it seems to us at present, nearly the climax, which, in this case, would seem to be the electrometer of Sir William Thomson. It would not be out of place here, probably, to state the distinction between electroscopes and electrometers, though these two words, even when referred to the original Greek, seem to be exactly synonymous; and although by referring to the dictionary one finds no distinction, yet in the language of science there is an evident difference, viz.:

1st. The term electroscope, is applied to such instruments as are used merely to indicate the presence or absence of electricity in a body, and not to indicate the amount.

2d. The term electrometer is used to indicate an instrument which is intended not only to determine the presence, but also the amount present of the electric fluids. These terms, although there is an evident distinction, are frequently, although incorrectly, interchanged. To return, after the pith-ball electroscope was in use some time, another and better one was devised, which is known as "Bennett's" or "Gold Leaf" electroscope. It consists of a metal tube, in which rests a glass shade, which is tubulated. In the tubature of the shade fits a metal rod which terminates at its upper extremity in a metal ball. It supports on its lower end two narrow strips of gold leaf. The interior space of the shade is kept free from moisture by calcium chloride. On the inside of the shade are two strips of gold leaf communicating with the ground. Now, if a body charged with electricity of either a positive or negative nature be brought near the metal ball the leaves diverge, and, consequently, such a phenomenon is recognized as

proof of electricity present. If it is necessary to determine the nature of the electricity, i. e. in regard to its positive or negative nature, the following plan must be pursued: If, while the instrument is under the influence of any body charged with either — or — electricity, the knob is touched by the finger, + or — electricity will be conveyed off, according to the state of the inducing body; if the inducing body be negatively charged, the — electricity will be carried off, by the medium of the finger, to the ground. We now remove the finger; the gold leaves, which by inducing action have been brought together, will now spread. The system is now charged with + electricity, and if now we bring a positively charged body near the knob, the leaves diverge more widely. If, on the contrary, we bring a negatively charged body, the electricity will be attracted to the knob, and will there be bound, as it were, and the leaves collapse. Another form of electrometer was devised by Lane, an English savant. It consists of an ordinary Leyden jar, on the same base of which is an upright metallic bar, into which a bar, capable of revolution on the upright rod as an axis. This second bar has two metal balls on its ends, each extremity; one of which is connected by wire to the outside of the Leyden jar. This contrivance is more to measure the shock of a jar than to apply it to any electrical machine.

The quadrant electroscopie is the name of a device for measuring amount and determining the presence of electricity. It is, however, incapable of determining the essential nature thereof. This instrument is never used when precision is needed, and is gradually being superseded by those instruments which are regarded more as curiosities than scientific appliances. I have now come to the instrument which is vastly more delicate than any of the preceding, i. e. "Thomson's Electrometer," which consists of a brown flat aluminium needle, hanging by a very light wire from the outer coating of a Leyden jar, which coating is in connection with the earth; the whole is covered by a glass bell jar, the interior of which is kept dry by either sulphuric acid or calcium chloride. The needle is suspended over four insulated quadrantal metallic plates; these plates are connected alternately by metal wires. If all the quadrants are charged by the same electricity the needle will be at rest over one of the diametrical slots; but if they are differently charged, then each end of the needle will be attracted by the metal plates oppositely charged, and repelled by those similarly charged. Hence, the needle is subjected to the action of a pair of couples.

In order to render the slightest motion visible, a small concave mirror is suspended about three feet distant from it. From this the light of a lamp is reflected to a scale, placed horizontally, and the deflection of the needle is measured by the motion of the spot of light on the scale.

A Curious Tree.

(For the Scientific News.)

Is the county of Ontario on the "Albany and Buffalo uniplex," is a great tree, which on account of its age and size, is known as "The Century Popple" (Poplar.)

Many years ago a man was walking along this road one morning, going West. Having reached the foot of Seneca Lake, he turned to assist him in walking, he cut a cane, and continued on his way. He reached Geneva at noon, where he took dinner, and afterward resumed his journey. Reaching a grove one mile west, and feeling fatigued, he stuck his cane in the ground, and went to sleep. It was late in the afternoon when he awoke, and surprised at having slept so long, he seized his bundle and resumed his walk. For some distance he continued on, when he happened to think of his cane. It would hardly pay, however, to go back, and just then a team coming along, he secured a ride and the cane was left to its fate.

One year afterward, the man made the same journey, and by accident stopped in the same grove to rest. As he sat down, he thought of the cane he had left a year ago, and looking around, saw it *growing!* The cane, freshly cut, and so soon set in the ground, had sprouted, and the top was covered with leaves. It grew and years after, on account of its history, when the grove was cut down it was spared and became a still more thriving tree. A dozen years ago the owner of the tree and the road-master had some difficulty, and the latter, to avenge himself, declared that it was an obstruction and must be cut down.

But the owner was a practical man; he purchased thirty pounds of spikes, which he had driven into the tree from the ground upward. The road-master was furious, but it was no use.

So the tree stood and grew, and now measures *fourteen feet* in circumference at the foot. The iron is believed to be the cause of its great age, its strength and size. DOM JOHN.

Friction and Wear of Conical Valves.

Ed. Scientific News:

PERMIT me to ask you to answer through the columns of your valued journal of which I am a reader:

Would there be any more wear, or greater friction in the use of a round taper valve (in form similar to what is familiarly known as a plug cock) than in the use of a plain flat slide valve, under similar circumstances, the two classes of valves being proportioned the same in respect to the amount of pressure holding them to their respective seats, and the areas of contact (or bearings) between the valve and seat in each case? And would there be a greater likelihood of wearing tight in the case of one or the other? As a mechanic, I am interested in getting a reliable opinion on the subject, or the results of some one's experience.

Very truly yours,

JOHN E. KING,
14 and 16 Water Street, Brooklyn.

We shall answer this question on theoretical grounds, leaving other correspondents who have had experience with this class of valves to answer from practice.

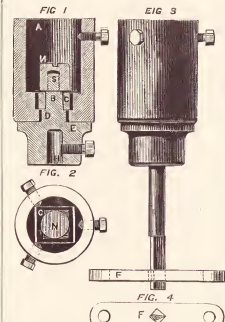
First, it is evident that the travel of any point in a conical valve will be either less or more than the travel of any other point which does not lie in the same plane at right angles with the axis of rotation of the valve. Those points which lie nearer the small end of the valve will travel less and those which lie nearer the large end will travel more. Theoretically, unequal travel, when all parts of a valve are subjected to equal pressure, should give unequal wear. Practically we believe such valves have been found more difficult to keep tight than plain slide-valves but we prefer to have those experienced in the use of conical valves answer positively on this point.

We see no reason why the friction of such valves should be greater than that of slide valves.—ED. SCI. NEWS.

Chucks for Drilling Square Holes.

In the accompanying engravings we present the chuck, by means of which square holes may be drilled, using the form of drill illustrated in the SCIENTIFIC NEWS of Oct. 1, 1878. Both the chuck and the drill are the invention of Mr. J. Hall, of Chancery Lane, London, England.

The chuck is constructed in such manner as to admit of the drill traveling automatically in a horizontal plane some little distance. This is rendered necessary by the peculiar movement of the cutting edges of the drill, which does not operate or rotate on a fixed central point, but diverges somewhat in proportion to the size of the hole.



The upper part of the cavity of a metal cylinder is bored out circularly, so as to fit on to the drilling spindle, to which it is screwed by one or more screws. Below the circular bore a square recess is made, and below this latter, and coming well within the limits of the square recess, there is a circular hole passing through the end of the cylinder. The drill holder or socket is in a separate piece, the bottom portion of which is provided with a square or round recess for holding the shanks or upper end of the drill, which is held firmly in its

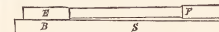
place by means of a set screw. The upper part consists, first, of a screw, S, at the top, Fig. 1; secondly, of a square shoulder, B; thirdly, of a circular shoulder, D; and, fourthly, of another but much larger circular shoulder, E. Through the circular hole at the bottom of the hollow cylinder the upper portion of the drill-holder is inserted until the large circular shoulder meets the bottom of the square shoulder. A loose square collar, A (Figs. 1 and 2), provided with an oblong rectangular slot, is then placed within the cylinder and over the square above mentioned, above and on to which is screwed down a nut, N, from the inside of the cylinder. The loose square is of such thickness that when the nut is tightened down on to the square shoulder the loose collar is left to work freely. When this is done the drill-holder will readily travel in a horizontal plane such distance as the play between two of the sides of the loose collar, and two of the sides of the square recess, in one direction, and in another direction the distance that the play between two of the sides of the small square shoulder of the drill-holder and the ends of the rectangular slot of the loose collar. The horizontal travel or play is proportionate to the size of the hole to be drilled. Near to the lower end or cutting edges of the drill is fixed rigidly a metal guide bar or plate, F. The guide bar is provided with a square hole similar to the hole it is required to drill, the dimensions of the three sides of the drill being such that the distance from the base to the apex of the triangle, which such three sides form, is the same as of the sides of the square hole it is required to drill.

Shop and House Hints.

To Set Rods after Welding.—Place the straight-edge as in Fig. 1, in which A is the rod end and S a straight-edge, whose end, B, is pressed firmly against

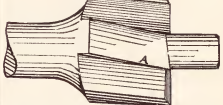


A, while the other end is lowered; when, if the faces are parallel, the edge of the straight-edge will just meet the rod face; otherwise the end of the straight-edge will either stand off or overlap the face. In Fig.

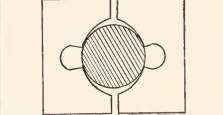


2, for example, the end B, placed fair against E, does not meet the face F; hence, the side-face of E is not in line or on the same plane as the side-face of F.

Countersinks to be used on iron or steel cut when the cutter stands at an angle, as shown in the accompanying illustration at A.



Dies for Hand Stocks should be tapered with a hob larger in diameter than the size of work the dies are to cut, to an amount equal to twice the depth of thread, so that when placed on the bolt they will appear as in the accompanying figure and not cut on the sides.



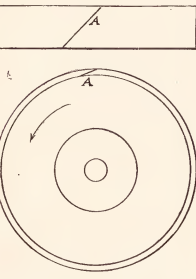
Ink for Writing on Tinned Iron.—Dissolve one gramme (15.73 grains) of sulphate of copper, with two drops of muriatic acid in twenty grammes of water, and add mucilage of gum arabic in sufficient quantity. This ink gives a permanent deep black stain on tin. The addition of some pyrogallic acid has the advantage of causing the writing to be immediately apparent, that is to say, while the writing is performed.

Water-Tight Packing Paper.—Packing paper may be made water-tight by dissolving 1/2 lb. of white soap in one quart of water, and dissolving in another quart 1/2 lb. of—sapoline or weight—of gum arabic, and 5/8 oz. of glue. The two solutions are to be mixed and warmed, the paper soaked in the mixture, and passed between rollers, or hung up to dry.

Metallic Shingles.—In our advertising columns will be found the card of the Iron Clad Mfg. Co. The metallic shingles advertised by this house are justly winning a wide popularity. No less than five millions have been manufactured and sold the present season. They make an elegant durable and water-tight roof, and are a great protection against fire.

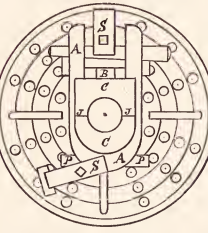
Cure for Asthma.—Dr. de Crevier, of Brie, has communicated to the *Practicien*, a French medical journal of repute, the following remedy for asthma, which he has successfully employed in cases of great urgency. Take equal weights of stramonium, sage, belladonna and digitalis; crush to about the coarseness of sawdust; damp a little, and mix in as much nitre as of one of the other substances. Burn a little on a plate, cover with a paper cone open at the top, and let the sufferer inhale the smoke. If the smoke is too abundant, damp the mixture with a little water.

The Joints of Leather-covered Wheels should be made as in the accompanying figures, the joint being shown at A, and the wheel running as denoted by the arrow, so that the pressure of the work tends to close the edges upon the wheel instead of tearing it off.



Bisulphide of Carbon.—D. H. C. The action of bisulphide of carbon upon the base metals, is first to form a sulphide, then to unite with the sulphide so formed to form a sulpho-carbonate. This occurs even at low temperatures, and would be the effect upon iron at the temperature named in your query. Bisulphide of carbon boils at 110°F , and a very high pressure would result from a temperature of 300°F , requiring a strong vessel to hold it. Exposed to atmospheric air, it spontaneously decomposes at ordinary temperatures, depositing crystalline sulphur, which attacks most metals.

Chucking Connecting-Rod Brasses in the Strap.—In the diagram is shown the method of chucking connecting-rod brasses in the strap. A A is the strap and C C are the brasses secured to their places in the strap by the key and gib, and the small block B. P is a parallel piece, another one being placed behind the strap, beneath the key and gib. S



S are the clamps holding the strap to the lathe face-plate. Thus the face of the strap is chucked fair with the face-plate, notwithstanding the flanges of the brasses, which are held clear of the lathe face-plate. The parallel strips should always be placed directly beneath the clamping plates to avoid springing the work.

R. C.—Steel stamps, such as you require, can be obtained in the N. Y. Stencil Works, whose advertisement you will find in our advertising columns. You can rely upon obtaining a good article from this house.

PREMIUM LIST.

Scientific News, 1880.

We desire to call the attention of our present subscribers, and others who may be induced to solicit subscriptions for the *SCIENTIFIC NEWS*, to the unprecedented list of premiums of money and articles of general utility and value presented herewith. Every article offered is from a First-Class Manufacturer and is guaranteed to be worth in this market the full retail value set against it.

In this enterprise, as in all others, we propose to deal upon strictly honorable and fair principles.

We offer, it will be seen, two classes of premiums, *Competitive* and *General*.

Those who intend to compete for the cash premiums must send us a written notice of such intention.

The class of general premiums is offered for specific numbers of subscribers only; but any one who competes for a cash premium, and fails to get it, may choose from the class of general premiums any article specified as the premium for such a number of subscribers as he may be able to secure, and will be entitled to receive such premium.

In this way, no one forwarding to us any number of subscribers equal to, or exceeding, the smallest number named in this list, will fail to receive a premium.

Remittances may be forwarded by check postal order, or in cash by express, express charges to be prepaid.

The charges for transportation on premiums must also be paid by the recipient.

Address S. H. Wales & Son, Office of the *SCIENTIFIC NEWS*, No. 10 Spruce St., New York.

LIST OF PREMIUMS.

CLASS I.

CASH PREMIUMS FOR COMPETITION.

No. 1.—For competition, we offer in cash as a premium for the largest number of subscribers sent in on or before Feb. 1st, 1880, by any single person, **\$100**

The subscriptions may be sent from different post-offices and in installments or all at once, as the person competing chooses.

No. 2.—For the second largest list we will give to the person sending the same, on same conditions, **\$50**

No. 3.—For the third largest list we will give as a premium, on same conditions as above, **\$25**

Those receiving these competitive premiums will not be entitled to premiums for the same subscribers from the general premium list which follows; but all those who enter as competitors and fail to obtain either of the competitive premiums, may demand for the number of subscribers they send us a premium corresponding thereto, as above explained.

GENERAL PREMIUMS.

These premiums may be selected, one premium corresponding to the number sent, or two or more premiums the equivalent of the same.

Any one approximating a number of subscribers for which is offered a particular premium may send us whatever number of subscribers he can get, and the money collected for the same. This will entitle him to such part of any premium he may select as would be in proportion to the number of subscribers sent. Then by remitting, in addition to the money collected from the subscribers, the difference between the value of such proportional part of the premium and the price set against the premium he may obtain it.

For example, suppose a person to obtain only half as many subscribers as would entitle him to some particular premium. Then by sending the money collected for such subscriptions and half the price set against the premium he will be entitled to it.

Or suppose he obtains only one third as many subscribers as would entitle him to some particular premium. Then by sending the money collected for the subscriptions and two thirds the price of the premium, he will get it.

GENERAL PREMIUM LIST.

No. 1. Wheeler and Wilson Sewing Machine. No. 8, plated, black and end leaves, cover, and 3 drawers, **\$50.00**
We will present this premium to any one who sends us 115 subscribers at \$1.10 each.

No. 2. Remington Half Cabinet Sewing Machine. drop leaf and two drawers, with hammer, feller, braider and gauge, **\$50.00**
Will be presented to any one sending us 105 subscribers at \$1.10 each.

No. 3. Remington Oval Barrel Shot-Gun. No. 10 or 12 gauge, 28 or 30 inch, walnut stock, de-carbonized steel barrel, **\$40.00**
Will be presented to any one sending us 100 subscribers at \$1.10 each.

No. 4. Marsh's Cylinder Bed Foot Lathe. A strictly business lathe, strong, accurately made and durable, 35 inch bed, turns 8 inches diameter and 22 inches long. Brass boxes, three cone pulleys and round belt **\$30.00**
Will be presented to any one sending us 65 subscribers at \$1.10 each.

No. 5. Wythe's Circle of the Sciences. A scientific library in itself, 4 royal octavo volumes, handsomely and substantially bound and profusely illustrated by steel and wood engravings, 2,346 pages, **\$25.00**
The subjects, all of which are treated by scientists of the first rank, are:

Heat.	Meteorology.
Light.	Climatology.
Photography.	Comparative Anatomy.
Electricity.	Zoology.
Electro-Metallurgy.	Ethnology.
Magnetism.	Botany.
Mechanical Physics.	Economic Botany.
Applied Mechanics.	Practical Geometry.
Astronomy.	Trigonometry, Plane and Spherical.
Navigation.	Mensuration.
Nautical Astronomy.	Logarithmic Tables of natural numbers, sines, etc.
Electro-Telegraphy.	Crystallography.
Acoustics.	Mineralogy.
Chemistry.	Geography.
Arithmetic.	Geology.
Algebra.	Spherical.
Series and Logarithms.	
Geometry, Plane and Spherical.	

Any one may gain a complete scientific education from this work.

We offer this premium to the first one who will send us 80 subscribers at \$1.10 each, if he chooses it in preference to other premiums. If he do not so choose, the next one who sends the same number of subscribers at the same rate, and wishes this valuable premium, may have it.

TAKE NOTICE.—We give this premium to the only one individual, and the first to apply for it on the conditions named will be the one to get it.

No. 6. A Magnificent Art Work. "Illustrated Catalogue of the Masterpieces of the United States International Exhibition of 1876," 46 parts at 50 cents each, **\$23.00**
Contains 40 steel plates of paintings and statuary, and over 1,000 wood engravings of the finest exhibits, with descriptive text.

We will present this to any one sending us 76 subscribers at \$1.10 each.

TAKE NOTICE.—Only one person can receive this premium, which is offered on the same conditions as No. 5.

No. 7. Fall Set Turning Tools. 45 in all, comprising 1 milling tool, 2 chasers, 2 bent inside tools, 4 flat tools, 2 side tools, 3 point tools, 4 round point tools, 8 gravers, 1 cutting off tool, 11 Gouges, graduated sizes, 10 chisels, graduated sizes, **\$31.25**

We will present this premium to any one sending us 72 subscribers at \$1.10 each.

No. 8. Witham's Eight Watch. Solid silver case, excellent time-keeper, **\$20.00**
We will give this premium to any one who will send us 40 subscribers at \$1.10 each.

No. 9. Tool Chest. Pack & Snyder—containing full set, 60 first-class tools, **\$40.00**
We will present this premium to any one who sends us 39 subscribers at \$1.10 each.

No. 10. Compound Microscope, with rack-motion and condenser, pivoted stand and walnut case, **\$15.00**

Good work can be done with this Instrument. We will give this premium to any one who sends us 40 subscribers at \$1.10.

No. 11. Elegant Graphoscope, with one doz. selected views, **\$10.00**
These views are of great interest, and may be selected from a long list, which will be forwarded to the applicant for the premium. They are first-class.

We will give this premium to any person sending us 22 subscribers at \$1.10 each.

No. 12. Same as above, without the views, **\$7.00**
We will give this premium to any one sending us 16 subscribers at \$1.10 each.

No. 13. Case Brass Drawing Instruments, German silver, 12 pieces, fine, **\$9.00**
We will give this premium to any one who sends us 20 subscribers at \$1.10 each.

No. 14. Microscope, 3 knes, pivoted stand, good, **\$6.75**
We will give this premium to any one who sends us 15 subscribers at \$1.10 each.

No. 15. Stereoscope. Rosewood, nickel-plated metal work, and one doz. selected views ... \$4.50

We will give this handsome premium to any one who sends us 12 subscribers at \$1.10 each. The views may be selected in the same manner as for No. 11.

No. 16. Same as above, without the views. \$3.00
We will give this premium to any one who sends us 8 subscribers at \$1.10 each.

No. 17. Photographic Album. Elegant, full Morocco, gilt edges, oblong, holds two cards. \$3.00
We will present this premium to any one who sends us 11 subscribers at \$1.10 each.

No. 18. Stereoscope, patent folding, with one doz. selected views. \$3.00
We will send this premium to any one who will forward us 8 subscribers at \$1.10 each.

No. 19. Same as No. 18, without the views. \$2.00
We will give this premium to any one who sends us 8 subscribers at \$1.10 each.

No. 20. Case Drawing Instruments, brass, 10 pieces, rosewood box, with tray. \$4.50
We will give this premium to any one who will send us 7 subscribers at \$1.10 each.

No. 21. Same as No. 20, without tray. \$2.25
We will give this to any one who sends 6 subscribers at \$1.10 each.

No. 22. Case of Brass Drawing Instruments, 10 pieces, smaller than Nos. 20 and 21. \$1.88
We will give this premium to any one who sends us 5 subscribers at \$1.10 each.

No. 23. Achromatic Spy-Glass. Very fine; 3 $\frac{1}{2}$ inches long, 1 $\frac{1}{2}$ inch object glass, 3 draws. \$3.00
We will give this premium to any one who sends us 13 subscribers at \$1.10.

No. 24. Achromatic Spy-Glass, 1 $\frac{1}{2}$ inches long, object glass 1 inch diameter, 3 draws. \$2.25
We will give this premium to any one who will send us 6 subscribers at \$1.10 each.

Archery Sets. Manufactured by Johnson, of Pittsburgh, Pa. Each set includes patent bow, $\frac{1}{4}$ doz. arrows, target, arrow-barrel, and arrow. \$4.00
We offer 3 sets only, of different sizes, each of which will be given to the first one who sends in the proper number of subscriptions to obtain it, with a request for the same. The retail prices of the sets are as follows:

No. 25. Target, 30 inches diameter; bow, 6 $\frac{1}{2}$ feet; arrows to suit, arm-guard and finger-tips. \$5.00
We will give this premium to the first one who selects it, sends us 25 subscribers at \$1.10 each.

No. 26. Target, 30 inches diameter; bow, 6 feet; arrows to suit, arm-guard and finger-tips. \$10.00
We will give this premium to the first one who selects it and sends in 20 subscribers at \$1.10 each.

No. 27. Target, 26 inches diameter; bow, 4 feet; arrows to suit, arm-guard and finger-tips. \$7.00
We will give this premium to the first one who selects it, and who sends us 14 subscribers at \$1.10 each.

The above bows and targets are patented. The bows have metallic centers with arrow-rests, or "carriage," as they are called, which permits the arrow to pass without touching the target, and on a line exactly midway between the tips of the bow, which secures accuracy of flight. The wood limbs of the bow are of standard growth white ash, handsomely painted, and are provided with nickel-plated metal tips that cannot break. They are detachable from the metallic centrepiece of the bow, which enables the weapon to be packed in small space for transportation. Remember we have only one set of each size to award; each to the first who claims it on above-named conditions.

No. 28. Improved Demco: Foot Lather, with scroll sawing attachment, solid emery wheel and 5 turning tools. \$5.00
This is the nearest thing to the lather ever offered at this price. Nothing like it in the market. Nicely fitted steel spindle. Collars, spur centre and screw for attaching chucks. Rosette and steel chucks go with it. No other lather has so many valuable attachments. Come policy, with two lifts, for heavy and light work, steel screw. Two rests, one 4 inch and one 12 inch. Remember all this goes in this premium, besides 25 New Process designs, 3 drill-points, 6 saw blades, screw-driver and Manual of Turning and Fret Sawing. These designs are a new invention and can be instantly transferred. \$3.00
Any one sending us 9 subscribers at \$1.10 each will receive this premium.

No. 29. Dolly Scroll Saw with 7 valuable implements; 1st. It has a scroll saw, emery wheel, ad. Improved change, 3d. Polishing, nickel-plated tilting table, 4th. Straining rod, 5th. Improved method of setting up, 6th. It will saw 30 inches from blade to handle. It is a new style of painting in ultramarine blue, decorated in gold and silver. With the saw we give free, 20 New Process designs, 6 extra blades, 1 Manual of Fret Sawing. These designs are a new invention and can be instantly transferred. \$3.00
Any one sending us 9 subscribers at \$1.10 each will receive this premium.

No. 30. Stylographic Pen, short, plain. \$3.00
No. 31. Stylographic Pen, gold-mounted. \$3.50
No. 32. Stylographic Pen, long, plain. \$3.50

No. 33. Stylographic Pen, gold-mounted. \$4.00

No. 34. Stylographic Pen, short, plain. \$4.00

No. 35. Stylographic Pen, gold-mounted. \$4.50

No. 36. Stylographic Pen, long, plain. \$4.50

No. 37. Stylographic Pen, gold-mounted. \$5.00
(Nos. 30 to 33 with alloy points, Nos. 34 to 37 with iridium points.)

These pens write with ink, but look like an ordinary ball-point pen. When filled with ink they can be used for a great deal of writing without any further supply and can be carried in the pocket without fear. Not a particle of ink escapes, except when writing. The distinctive feature of the pen is that it can be held point downward for any length of time and not a drop of ink will escape, but touch the writing point to a piece of paper, and it makes a mark. Draw the pen along on the paper and it makes a continuous line. The pen will write at a single filling from 8,000 to 20,000 words. The materials used in its construction, vulcanized rubber, gold, silver and iridium, are non-corrosive; no drying or evaporation of the ink occurs; the pen can be filled in a moment; it works equally well on any kind of paper; any kind of copying ink or writing fluid can be used; it can be carried in the pocket without fear of any blotting; it can scarcely get out of order. The entire construction is very simple, and the point, the only part liable to injury, is covered with a fine wire with an elastic tip. We have had this pen in continuous use in our office for months and speak positively of its merits.

No. 30 will be given for 5 subscribers at \$1.10 each.

No. 31 will be given for 6 subscribers at \$1.10 each.

No. 32 will be given for 6 subscribers at \$1.10 each.

No. 33 will be given for 7 subscribers at \$1.10 each.

No. 34 will be given for 7 subscribers at \$1.10 each.

No. 35 will be given for 8 subscribers at \$1.10 each.

No. 36 will be given for 9 subscribers at \$1.10 each.

Chirographs.—This is a new and valuable invention now largely used for copying letters, drawings, etc. It outdoes the electric pen, penograph, or anything hitherto devised for such purposes. From a single letter or drawing one to two hundred copies may be made. The apparatus is so simple that any one can operate it. Letters, music, circulars, price lists, etc. are now largely copied by it. It consists of a moist, flexible and elastic pad, a bottle of ink and a sponge. The letters, drawings, sheet of music or document to be copied is written with an ordinary pen, and while the ink is fresh placed face downward on the pad and gently rubbed on the back with the fingers. This prepares the pad for producing the copies, which is done by placing any kind of blank paper on the pad and rubbing the fingers over the original sheet. The sponge is used in cleaning the pad, water being the liquid used for the purpose.

No. 38. Chirograph, pad 10 x 12 $\frac{1}{2}$ inches. \$5.00
No. 39. Chirograph, pad 6 $\frac{1}{2}$ x 10 inches. \$3.00
We will give No. 38 to any one applying for it with 12 subscribers at \$1.10 each.

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BOOK NOTICES.

ATWOOD'S REVISED RULES OF PROPORTION, Compiled and Original, and Adapted to Modern Practice, by J. H. Atwood. Second edition. Thirteen plates (eight plates before published). One 12mo, cloth. Sent post-paid, on receipt of price, \$1. New York: Hicknell & Comstock, Publishers, No. 27 Warren Street.

This edition of one of the valuable architectural treatises published in this house has been called for by the great favor with which the first was received. The purpose of the work, as expressed in the author's preface, is well carried out. It is "to relieve the operative from the perplexing labor he is often compelled to make, in the absence of any definite rule for determining relative sizes, and also to furnish architects who have not reduced their experience and study of fitness to uniform results, with ready answers on any minor detail of the edifice.

FUEL: ITS COMBUSTION AND ECONOMY. Consisting of Abridgments of "Treatise on the Combustion of Coal, and the Prevention of Smoke," by C. Wye Williams, A. I. C. E., and "The Economy of Fuel," by T. Sykes Pridmore. With Extensive Additions on Recent Practice in the Combustion and Economy of Fuel: Coal, Coke, Wood, Petroleum, Etc., by the Editor, Dr. Kinner. Edited by the Editor of the Institution of Civil Engineers. Author of a "Manual of Rules, Tables and Working," "Tramways; their Construction and Working," Etc., Etc. London: Crosby, Lockwood & Co., New York: Dr. Van Nostrand, 23 Murray and 27 Warren Streets, 1879.

An important and timely book on a most important subject. The names of the authors whose treatises form the basis of the work are alone a sufficient guarantee of the value of the book. Most of those who think there is nothing left to learn in their practice of fuel consumption, will probably rise from a perusal of this work with surprise at their enlarged views of the real extent of the fuel-shed that lies in the hands of every owner of a steam-boiler, furnace, or other appliance for applying heat to industrial purposes. It is neatly bound in cloth, comprises 304 pages, with numerous illustrations and a copious index, and its retail price is only \$1.50.

The Postage of the World.

Dr. FISHER, an *Overseaspost* of the Imperial German Post Office (corresponding to the assistant secretary with us), has just published an

interesting pamphlet, showing the comparative postal and telegraphic statistics. But in some cases the information yet available does not enable him to bring down the work later than 1873. The letter post of the whole world for that year amounted in round numbers to 9,900,000,000 letters, or about 9½ millions daily; and the numbers have been increasing daily at an astonishing rate. Thus in Japan the number of post offices in 1872 were 1,150, and in 1876 it had risen to 3,640. The number of separate articles which passed through the Japanese post in 1878 was 47,000,000, of which 25,000,000 were letters, 10,000,000 postal cards, 9½ millions newspapers. Post cards were first brought into use only in 1865, and now they are employed in almost every country in the world. The parcel post has, however, not yet got beyond the first stage of its development. The number of telegraphic dispatches sent in 1877 amounted for the whole globe to nearly 130,000,000.

List of Patents Granted November 25th and December 2nd, 1879.

We will supply copies of any of the patents in this list, post-paid, to any address in the United States or Canada, on receipt of 50 cents per copy.

PATENTS GRANTED NOVEMBER 25TH, 1879.

Air-compressor, J. Clayton.....	222,014
Air or vacuum railway-brakes, diaphragm for, L. Stowe.....	221,670
Amalgamating apparatus, vacuum, J. R. Alderman.....	221,690
Amalgamating pump, E. B. Bryant.....	221,691
Amalgamating pump, device for discharging, E. Coleman.....	222,013
Auger, hollow, W. F. French.....	222,015
Axle, car, S. D. Webster.....	221,978
Bale-ble, R. M. Pustill.....	221,975
Balilets, upset or hot, J. H. Archer.....	221,976
Bar, J. H. Archer.....	221,977
Bag-fugger, I. W. H. B. Bryant.....	221,694
Barrel safety attachment, J. E. Flynn.....	222,029
Barrel rack for tiering, F. Stitt.....	221,943
Bell, invalid, J. H. Archer.....	221,972
Beehive, J. Barnes.....	221,999
Bell, cell, J. W. Butler.....	222,000
Berth for vessels, self-lowering, D. Huston.....	222,049
Berth for vessels, self-lowering, D. Huston.....	222,050
Billboard-cutter, cut, gate, and roller, J. H. Huston.....	222,051
Binder, temporary, W. A. Hanson (reissue).....	8,880
Bind-drawing machine, J. B. Thompson (reissue).....	8,861
Boiling-dish, cleaning, W. H. Moses.....	221,937
Book, T. S. Glover.....	222,053
Booms, device for raising and lowering, H. T. Stock.....	221,946
Boots and shoe last burner, machine, Z. Jacobson.....	221,953
Boots and shoe last burner, machine, Z. Jacobson.....	221,954
Boots, nursing, M. A. Michales and J. M. Bald.....	221,970
Box-holes, machine for finishing, N. L. Seelye.....	222,083
Brackets, A. W. Macgregor.....	222,084
Brick-off bearing case, W. H. Ludlow.....	222,085
Bricks for constructing sillings, partition walls, etc., J. Marsh.....	221,968
Brush, C. L. Ford.....	221,976
Brush for washing, J. G. Bagbee.....	222,007
Buckle, G. G. Bagbee.....	222,008
Buckle and trace-carriage, combined, T. L. Wiswell.....	221,944
Bung, W. H. Stewart.....	222,009
Burner-holder and spirit-lamp, combined, T. S. Waters.....	222,010
Butter-hole cutter, M. L. and G. L. Sanborn.....	222,086
Butter-puller, etc., machine for, H. Schlatter and H. C. Greis.....	222,087
Calisthenic motion, A. S. Gear.....	221,939
Car door, grain, W. S. Straff.....	222,007
Car-seat, E. Clementson.....	221,969
Cars, cooling and ventilating, W. F. Williamson.....	221,988
Carburetor, J. Wayman.....	221,948
Card, visiting, F. Oechli.....	221,933
Carpet hangings and similar fabrics, machine for making, J. C. Lory.....	222,017
Carriage-top, J. N. Hazelup.....	222,043
Carriage-top, J. N. Hazelup.....	222,044
Carriage-top, J. N. Hazelup.....	222,045
Carriage-top, J. N. Hazelup.....	222,046
Castings, malleable-iron, I. R. Aswood.....	221,990
Cattle-chute, J. J. Adkins.....	221,941
Cement, manufacture of artificial hydraulic or Portland, C. Brown.....	222,004
Children's chair, leather, W. N. Rhodes.....	222,001
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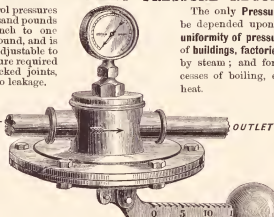
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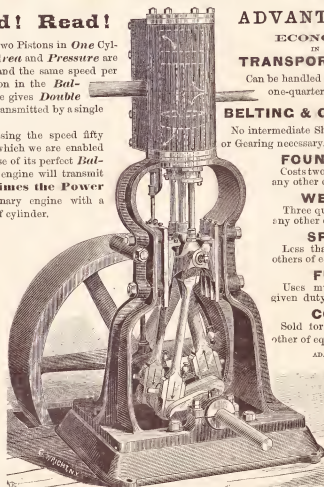
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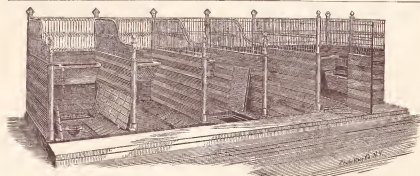
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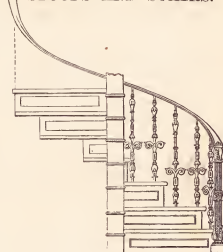
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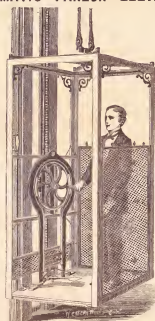


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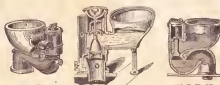
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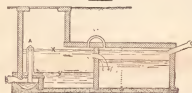
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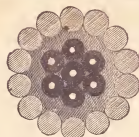
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